ALTERUS

service manual

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1. General description

ALTERUS is an advances, yet simple organ piston controller, which ensures simple and quick installation, very easy operation and removable media support. Graphic LCD display can display (in addition to standard bank/combination number) bank names, that can be edited by the user. Operating the controller is very simple and is mostly done by the rotating wheel and four special buttons (next, previous, reset, store).

ALTERUS uses standard SD cards as its memory media (same, that are used in mobile phones, cameras ...), which means simple and cheap memory extension. Actually - it's so cheap, that every single organ player can have its own memory card and therefore situations, where one organist re-wrote/deleted other organist's data, are becoming history!

Editing piston combinations can be done on organs (offcourse!), but it is also possible to edit them at home, using any Windows based computer and special ALTERUS PC software. This way, all (or most) work can be done at home and afterwards the organ player only inserts the memory card in the organs and starts playing. This is especially useful at locations, where many users is using the organs (music schools, music academy, concert halls ...).

ALTERUS highlights

- Storing of **999 combinations** in **99 different banks**. That means: 99*999 = almost **100.000 memory places**! On a single SD card. Then you replace it and have another 100.000 places. And so on ...
- Data is stored on **standard SD card**. Each musician can have its own SD card. No more data rewriting from another organist!
- **Delete & Insert functions**: possibility to insert a new combination or delete a specific combination within pre-programmed sequence!
- Programmable **Cressendo function** with up to 32 levels.
- Programmable **fixed combinations** (pp, mf, ff, tutti ...)
- System is operated using **rolling wheel and 4 buttons** (previous, next, store, reset) only. Operating is so simple, that anyone can do it, even without manuals!
- Main board is equipped with **48 inputs** and **48 outputs** for piston controls by default. **Extension boards** are avalible for bigger organs to increase inputs and outputs.
- **ALTERUS PC software** adds option to organists, that an organ player can prepare his combinations at home. Then, he just comes, inserts SD card into organs and starts playing!

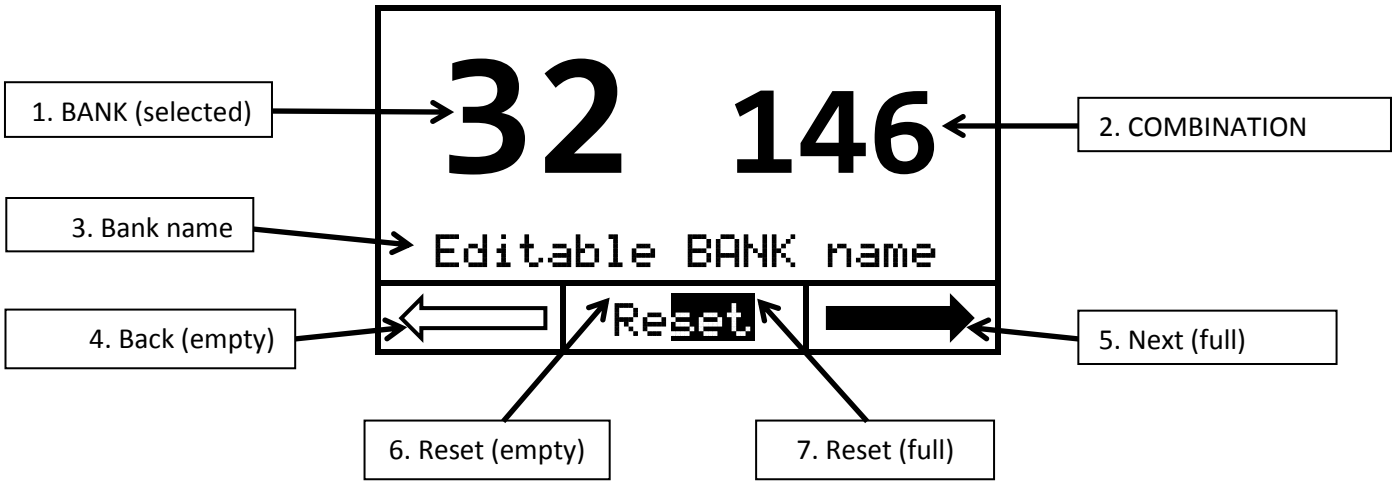
2. Operating ALTERUS

Normally, ALTERUS operates with inserted SD memory card. Each card contains 99 databanks and each databank contains 999 piston combinations.

In case, that SD card is not inserted, a warning message »SD card missing!« is displayed, however organ can still be operated without save/recall functions activated (following functions are active: piston control, cressendo, fixed combinations)

2.1 Graphic Display

ALTERUS is equipped with graphic LCD display, which displays actual data such as selected bank, combination, bank name and other information regarding to the system.



1. Number of the currently selected bank (0-99)
2. Number of the currently selected combination (0-999) within bank
3. Bank name (up to 20 characters)
4. Arrow above the »back« button; empty arrow means, that current piston combinations does not match stored combination or that bank/combination displayed is not active.
5. Arrow above the »next« button; full arrow means, that current piston combinations does match stored combination – displayed bank/combination is active.
6. Text above the »Reset« button, empty; Reset function is activated – all pistons are set to off.
7. Text above the »Reset« button, full; anytime we can disable all pistons by pressing »Reset« button. In this case, Reset text changes colour. Pressing the »Reset« button again restores previous piston state.

2.2 Selecting the piston combination

After the organs are turned on, ALTERUS is initialized and we may select any bank or combination using the rotating wheel. Rotating the wheel we increase/decrease the number, short press on the rotating wheel switches between changing the bank and changing the combination. Parameter, that is currently adjustable, is displayed with bigger numbers.

After a proper bank/combination is selected, we can activate (set pistons to positions) it pressing »Next« button.

N.b. When changing the bank, combination is automatically changed to 1.

By default, after organ startup ALTERUS jumps to bank 1 and combination 1. However, we may change this default behaviour using the ALTERUS PC software. This way, we may select to which bank and combinations organs go, after the system is started.

2.2.1 Step-by-step piston combination recall

1. Turning the rotating wheel select the desired memory bank.[1]
2. Short press on the rotating wheel to switch to combination adjustment mode. Combination number gets bigger.
3. Turning the rotating wheel select the desired combination.
4. For activating combination press »Next« button. Arrows and Reset on display goes coloured and pistons move to stored positions.
5. For activating the next combination press »Next« button. For returning to the previous combination, press the »Previous« button.
6. You can deactivate all the pistons anytime by pressing the »Reset« button. Pressing »Next« or »Reset« button again will sett the pistons to the position before deactivating.
7. If you want to change the bank or combination, use the rotating wheel. When using the rotating wheel, systems goes to inactive state (arrows and reset are not coloured) and combination gets active (changes) only, when pressing »Next« button.

2.3 Saving the piston combinations

1. Set the pistons to desired positions.
2. Using the rotating wheel move to the bank and combination, where you want to store current pistons set.
3. Press the »Save« button to save current piston set to selected combination. After saving, combination will automatically increase by 1.
4. Change the pistons regarding to the next combination and press »Save« button again.

WARNING! When storing the combinations, old piston combinations will be rewritten without any warning! Be careful not to re-write the combinations, which you will still need!

[1] If turning the rotating wheel changes combination numbers instead of the banks, short press the rotating wheel. Wheel rotating always changes the parameter, that is written in big numbers.

2.4 Controller lock

To avoid unattended changes, ALTERUS can be locked. Press and hold the rotating wheel for 3 seconds and keylock icon will be displayed on a display. Now all settings are locked (pistons …) and cannot be changed.

To unlock the ALTERUS, press and hold rotating wheel again, until the unlocked keylock icon is displayed.

2.5 Cressendo function

ALTERUS supports 32-level »cressendo«, which can be programmed into internal EEPROM memory, so it is operational also, when no SD card is inserted. Usually, this function is only programmed when the organs are set up.

Later changes of the cressendo levels is possible using the service program and SD memory card.

2.6 Using the ALTERUS without memory card inserted

ALTERUS can also be used without SD memory card, however there's some missing functionality: storing and recalling the combination is not possible.

In this case, »SD card missing« warning message is displayed.

If fixed piston combinations (piano, forte, tutti …) or cressendo function are programmed, they will operate without SD card inserted as well.

2.7 System menu

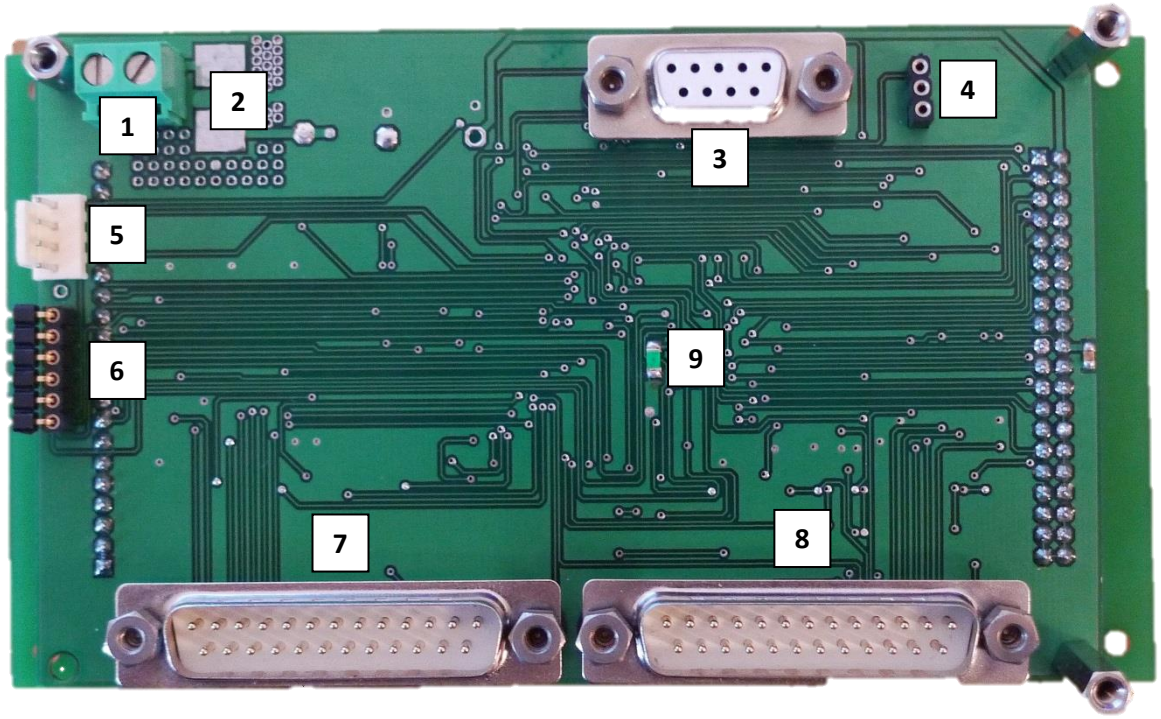
System menu includes several possibilities for internal test procedures and is not meant to be used by the end-user. We reccoment, that you do not enter it, except if instructed so (for example, remote troubleshooting).

Entering the system menu procedude:

- Press and hold the rotating wheel
- Press and hold »Save« button
- Hold both buttons for approx. 3 seconds

3. Connections and programming

3.1 Alterus main board »ALTERUS MAIN« (behind LCD display)



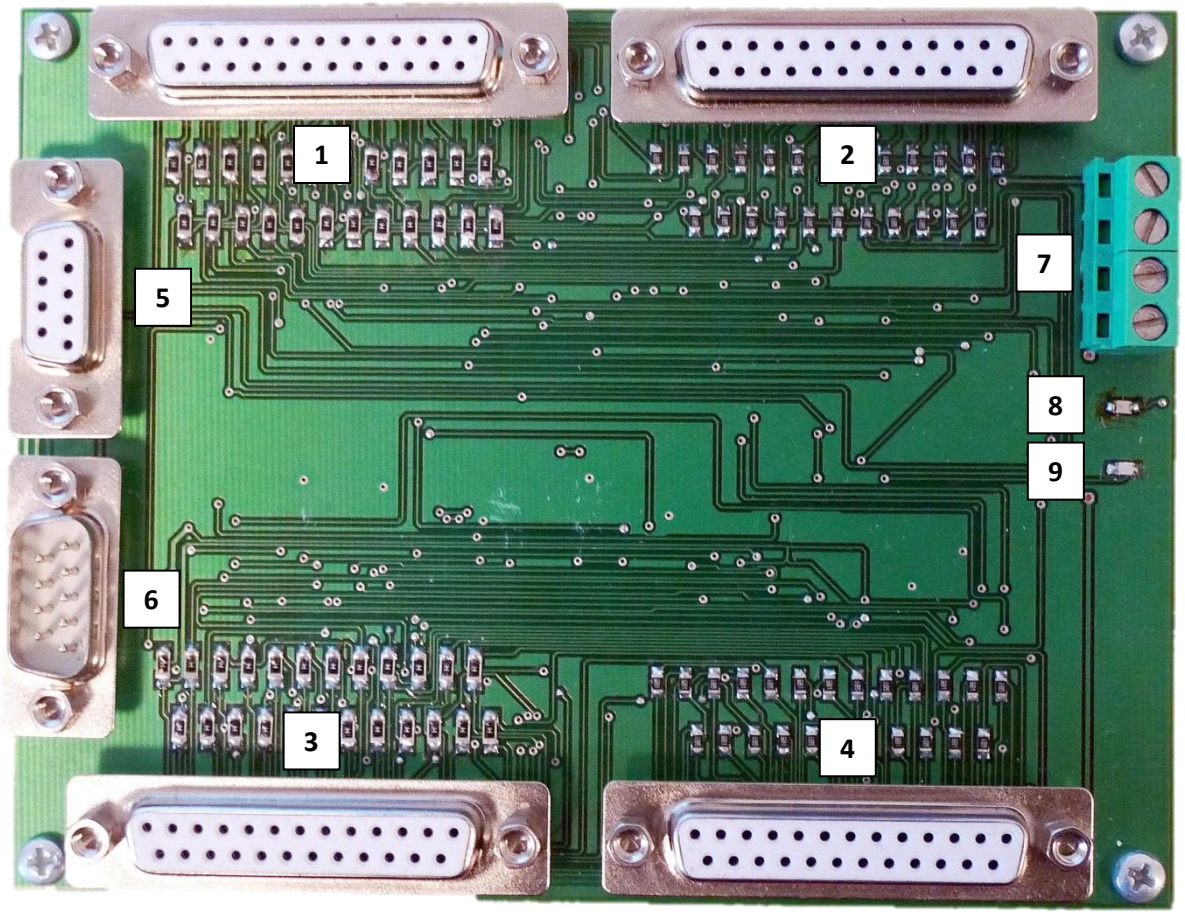
	Type	Function	Notes
1.	Terminal	Power supply 12-24 VDC*	Terminal near the fuse is positive(+)
2.	/	SMD fuse	1,25 A
3.	DB9 F	Expand connector	I2C and UART to expansion boards
4.	3 pin header F	UART	Service access to the controller
5.	4+1 pin header M	Prev/next/save/reset	NO, to GND (pin 5)
6.	6 pin header F	SPI	ISP programming interface
7.	DB25 M	Inputs 1-24	NO, to GND (pin 25)
8.	DB25 M	Inputs 25-48	NO, to GND (pin 25)
9.	LED1	Status LED	

**Power supply can also be connected on any of expansion boards; in this case, main board is powered through expand (DB9) interface and there's no need for additional powering the main board.*

For connecting the buttons and LED diodes (DB25), we reccomend using 25-wire Tasker cable.

For expand connector (DB9) we reccomend using shielded SFTP cable (8+1).

3.2 Output expansion board »ALTERUS OUT48« (48 channels)



	Type	Function	Notes
1.	DB25 F	Outputs 1-24	Pin 1-24 pull-up, pin 25 GND
2.	DB25 F	LED 1-24	Pin 1-24 GND, pin 25 +VCC
3.	DB25 F	Outputs 25-48	Pin 25-48 pull-up, pin 25 GND
4.	DB25 F	LED 25-48	Pin 25-48 GND, pin 25 +VCC
5.	DB9 F	Expansion connector	Connect to next expansion board
6.	DB9 M	Expansion connector	Connect to main board (or previous extension board)
7.	Terminal	Power supply 12-24 VDC*	1,3 (+), 2,4 (-) (od zgoraj navzdol)
8.	LED1	Power supply indication	12-24 VDC
9.	LED2	+5V voltage indication	Stabilizator je na glavni plošči

**Power supply can also be connected on any of expansion boards; in this case, main board is powered through expand (DB9) interface and there's no need for additional powering the main board.*

The output board has already pre-soldered current limiting resistors for LED diodes, that signal piston status. Resistors (0805 size) are located by the DB25 LED connectors. By default, resistors are selected for using green/red LED diodes using +5V power line.

3.3 Power supply reccomedations

ALTERUS is equipped with switching power supply with wide operation range (7-35 VDC). Most organ systems and magnets work on 12 or 24 VDC, which means that this power supply can also be used for powering the ALTERUS. However, such power supply must be powerful enough to ensure stable power supply, which does not lower during the high load periods (for example, activating all pistons at the same time).

All boards (main, expansion) are equipped with terminals, where main power supply can be connected. Main power supply is distributed among the boards using DB9 extension cable, which means that there's no need for connecting the main power cable to each board.

3.4 Fixed combinations (p, mf, tutti …)

ALTERUS ensures »fixed combination« functionality, which means that any input can be programmed into fixed combination (like p, mf, tutti …), which is usual for some organ types. This way, also a player, which is not familiar with an instrument.

We can assign a fixed combination to any ALTERUS input. When user activates this input, pistons move to pre-set position and stay like this, until user activates other combination or recall any other combination from a memory.

Fixed combinations are stored in ALTERUS's EEPROM memory, which means that they work also without SD card inserted.

3.4.1 Programming procedure – fixed combinations

1. Put SD card in a computer. Create ECOMB.TXT file on the card root.

2. Fill the file using notepad (or similar editor) with following data:
   `xx-A,B,C,D,E,F,G,H,I,J,K,L,M,N,O,P` where
   xx: input number, which activates/deactivates fixed combination (for example 48 or 8; there's no need to write 0 (like 08) with 1-digit number)
   A (B, C …): decimal entry (0-255) of the binary valve of 8 outputs (A=1-8, B=9-16 … P=121-128). You may use calculator for decimal-binary transformation.

   File can consist of max. 8 lines!
   If there's no data avalible for higher combinations (i.e. only 48 outputs used), use »0« for higher combinations.

3. Insert the SD card into controller. After sucessful reading, data is stored into EEPROM and ECOMB.TXT is deleted from the SD card.

3.5 »Cressendo« funkcija (krmiljenje s pedalom)

ALTERUS has built-in programmable 32-level »cressendo«, which means 32 pre-programmed fixed combinations, which are activated regarding to the »cressendo« potentiometer on a pedal. Cressendo function must be turned on, which is done using any input button (programmable).

Cressendo combinations are written into EEPROM memory, which means that this function works also without SD card inserted into the ALTERUS controller.

3.5.1 Programming procedure - cressendo

1. Put SD card in a computer. Create CRESS.TXT file on the card root.
2. Fill the file using notepad (or similar editor) with following data:

```
xxx                                (line 1)
A,B,C,D,E,F,G,H,I,J,K,L,M,N,O,P    (line 2)
A,B,C,D,E,F,G,H,I,J,K,L,M,N,O,P
…
A,B,C,D,E,F,G,H,I,J,K,L,M,N,O,P    (line 33)
```

   xx: input number, which activates/deacivates cressendo function, 1-128 (i.e. 48 or 8; there's no need to write 0 (like 08) with 1-digit number

   A (B, C …): decimal entry (0-255) of the binary valve of 8 outputs (A=1-8, B=9-16 … P=121-128). You may use calculator for decimal-binary transformation.

   If there's no data avalible for higher combinations (i.e. only 48 outputs used), use »0« for higher combinations.
   You must set all 32 combinations, if you want to use full potentiometer range (0-5 V). If you want to use i.e. only 16 combinations, then simply duplicate combinations (1+2, 3+4 … 31+32)
3. After successful reading, data is stored into EEPROM memory and CRESS.TXT file is deleted.

3.5.2 Connecting the »cressendo« potentiometer

Cressendo control signal should be linear 0-5 VDC signal, which can be obtained by any linear potentiometer, connected to cressendo pedal. We connect the potentiometer output (middle pin) to pre-prepared input of the ALTERUS controller (input nr. 25).

For connecting the potentiomer, a slight modification is needed on input nr. 25. 10k resistor (SMD 0805) should be removed and 1k resistor (SMD 0805) should be replaced with 0R (bridge). If you specify the cressendo usage on placing order, we do the modification with no additional costs.

We suggest dust-proof linear potentiometers in range 10-50 kOhm, which are more durable and easier for mounting than rotation potentiometers. Use shielded cable between potentiometer and ALTERUS (connect the shield to ground on ALTERUS side).

4. Technical specifications

4.1 Main board: ALTERUS-MAIN

- Number of inputs: 48
- Display type: GLCD, 128x64, white on black
- Buttons: next, prev, save, reset + rotary encoder
- Input type: NO, pull-up
- Number of banks: 99, possible to rename (up to 20 chars)
- Number of combinations: 999 (within single bank)
- Data storage media: SD memory card, up to 16 GB + EEPROM
- Power supply: 12-24 VDC

4.2 Expansion board: ALTERUS OUT48

- Number of outputs: 48 (signal) + 48 (LED)
- Output type - signal: Pull-up toward VCC (12-24 V), GND when activated
- Output type – LED: GND when activated, common anode (+)

4.3 Expansion board: ALTERUS IN48

- Number of inputs: 48
- Input type: NO, pull-up (GND)